REPORT

GEOTECHNICAL INVESTIGATION FIRE STATION 36 San Jose, California

Prepared for
City of San Jose
Department of Public Works
City Facilities Architectural Services
675 N. First Street, Room 300
San Jose, CA 95112

August 30, 2007

URS

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Project No. 28649866

City of San Jose
Department of Public Works
City Facilities Architectural Services
675 North First Street, Room 300
San Jose, California 95112

Attention: Mr. Bijan Abouzia
Associate Architect

Subject: Geotechnical Investigation
Proposed Fire Station 36
Yerba Buena Road and Silver Creek Road
San Jose, California

Ladies/Gentlemen:

We have investigated the conditions at the site of the proposed Fire Station 36 in San Jose, California. The purpose of the investigation was to develop design recommendations regarding foundation support, as well as opinions regarding other geotechnical aspects of site development. Five exploratory borings were drilled at the site to study the subsurface conditions.

The accompanying report presents opinions and design recommendations which have been based on the results of field exploration and laboratory testing, as well as engineering judgment and experience with similar projects.

We thank you for the opportunity to be of service on this project. If any questions should arise regarding the contents of this report, or if we can be of further service, please contact our office at your convenience.

Sincerely,

Jose I. Landazuri, G.E. 501
Senior Project Manager

cc: Addressee (5)

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Appendix A Field Exploration and Laboratory Testing
Appendix B Guide Specifications for Earthwork

This report presents the results of our geotechnical investigation for the proposed Fire Station 36 to be constructed at the intersection of Yerba Buena Road and Silver Creek Road in San Jose, California (Figure 1). Included in this report are the logs of five exploratory borings completed for this investigation, and our geotechnical conclusions and recommendations for design and construction.

1.1 PROJECT DESCRIPTION

We understand that the new fire station will be an Essential Services Facility and will consist of a one and two-story structure with slab-on-grade floors, and with overall plan dimensions of about 50 feet by 90 feet with adjacent vehicular parking. Portland cement concrete pavement for fire vehicle parking and access is planned. Although no structural plans are currently available, we have assumed that the proposed structure will be relatively light.

1.2 SCOPE OF SERVICES

Our scope of services included field exploration, engineering analyses, and preparation of this report. Specifically our work included the following tasks:

1.2.1 Review of Geological Data

This part of our scope was completed to provide an evaluation of potential geologic hazards at the project site. Geologic information reviewed for the project included:

- Geologic maps and reports published by the U.S.Geological Survey
- Geologic maps and reports published by the California Geological Survey
- Alquist-Priolo zone fault maps published by the California Geological Survey
- On-line seismic hazard zone maps from the California Geological Survey
- On-line geologic hazard zone maps from Santa Clara County
- On-line flood hazard maps from Santa Clara Valley Water District

1.2.2 Field Exploration

The field exploration included logging five exploratory borings drilled at the site to depths of 15 to 50 feet. URS also coordinated buried utility locations and clearance with City representatives and Cruz Brothers, a private utility locating service.

1.2.3 Laboratory Tests

Laboratory tests were performed to estimate the engineering properties of the subsurface soils encountered in the borings. Specifically, the tests included moisture content, dry density, unconfined compressive strength, R-value and plasticity testing.

1.2.4 Engineering Analyses and Recommendations

We developed geotechnical recommendations for the proposed facility as follows:

- Feasible foundation types, depths and design parameters, including resistance to lateral loads;
- Foundation settlement estimates;
- Site seismicity, including UBC Site Coefficients;
- Support of slab-on-grade floors;
- Recommendations for earthwork, site grading, and underground utility backfilling;
- Structural pavement sections for fire truck access and parking; and
- Potential for earthquake induced soil liquefaction

1.2.5 Report

Preparation of this geotechnical report summarizing our findings.

2.1 SITE CONDITIONS

Fire Station 36 will be located at the east corner of the intersection of Yerba Buena Road and Silver Creek Road in San Jose. The site currently supports several trees, and is traversed by a PG&E eastment.

2.2 SUBSURFACE CONDITIONS

2.2.1 Field Exploration

The subsurface conditions were investigated by drilling five exploratory borings (Borings B1 through B5) at the approximate locations shown on Figure 2. A detailed discussion of the techniques used for the subsurface investigation is presented in Appendix A. The depths of borings ranged from 15 to 50 feet below the existing ground surface (bgs). Figure A-1 presents the Unified Soil Classification System, as well as guidelines summarizing soil consistency and relative density used in preparation of the boring logs. Figure A-2 illustrates the notation used for the types of samples and methods of advancing them. Comprehensive descriptions of the soils encountered at each location are presented on the Logs of Borings in Figures A-3 through A-7. The soil conditions encountered are summarized in Section 2.2.3.

2.2.2 Laboratory Testing

Soil samples were carefully sealed in the field and returned to our laboratory for testing. Soil classifications made in the field were verified in the laboratory after further examination and testing. Laboratory tests were performed on selected soil samples. These tests include water content, dry density, unconfined compressive strength, and R-value. The results of these tests are presented at the corresponding sample locations on the Log of Borings, Figures A-3 through A-7.

Atterberg limits (liquid and plastic limits) tests for fine grained soil samples were performed; the results of these tests are presented in Figure A-8. An R-value test was performed on a selected bulk sample at the project site; the results of this test are presented in Figure A-9. A more comprehensive discussion of the laboratory testing program is presented in Appendix A.

2.2.3 Soil Conditions

In borings B1 through B4, stiff to hard silty and sandy clays extending to depths ranging from 5 to 9 feet were encountered. Below this layer, stiff clays and very dense sands were encountered to depths of 20 to 30 feet, underlain by stiff to hard lean clays and very dense sands to 50 feet, the terminal depth of Boring B1. Boring B5 encountered medium dense to dense sandy silt to a depth of 13.5 feet, underlain by very dense silty sand to 15 feet, the terminal depth of Boring B5.

2.2.4 Groundwater

Groundwater was not encountered in any boring during drilling.

2.3 GEOLOGIC SETTING

The proposed Fire Station 36 is located within the eastern Santa Clara Valley, an alluvial basin located between the Santa Cruz Mountains to the southwest and the Diablo Range to the northeast. The Santa Clara Valley is located between the active San Andreas fault to the west, and the Hayward and Calaveras faults to the east. Each of these faults has produced damaging earthquakes during historic time. The valley margins are marked by belts of active thrust faults; the Foothills fault system to the southwest and the East Valley thrusts (Southeast Extension of the Hayward fault) to the northeast (Fenton and Hitchcock, 2002).

The Foothills fault system is a series of southwest-dipping thrust faults located along the range front of the Santa Cruz Mountains (Bürgmann et al., 1994). The Monte Vista-Shannon and Sargent faults are the main active faults in the Foothills thrust system. The Monte Vista-Shannon thrust is approximately 41 km long and dips at a moderate angle to the southwest, merging with the San Andreas fault at depth. The Sargent fault is approximately 56 km long and merges with the San Andreas fault near Loma Prieta.

The East Valley thrusts are a series of northeast-dipping thrust faults that mark the junction between the southern end of the Hayward fault and the southern and central segments of the Calaveras fault. These faults, which include the Quimby, Piercy, Evergreen, Silver Creek, Coyote Creek, Berryessa, Crosley, and Warm Springs faults, are relatively short, less than 19 miles long, and appear to merge with the Calaveras faults at relatively shallow depths (Jones et al., 1994). Recent geologic and geomorphic investigations along both the Foothills and East Valley thrust systems indicate that they are active and may be capable of generating damaging earthquakes (Hitchcock and Kelson, 1999; Fenton and Hitchcock, 2002).

The geology at Fire Station 36 has been mapped by Witter et al. (2006) as Pleistocene undifferentiated alluvial deposits. The geologic map of Santa Clara County, California (Brabb and Dibblee, 1974) maps the area as Quaternary older alluvial fan deposits. These materials are described as interbedded silt and clay with some sand and gravel. The site is located just to the north of a relatively large body of Franciscan Complex bedrock including serpentinite, mélange shale and sandstone.

2.4 GEOLOGIC HAZARDS

2.4.1 Geologic Resources

Resources consulted for geologic hazard assessments included:

- Geologic maps of the U.S. Geological Survey; Alquist-Priolo Earthquake Fault Zone maps.
- Alquist-Priolo Earthquake Fault Zone maps;
- On-line seismic hazard zone maps from the California Geological Survey;
- On-line geologic hazard zone maps from Santa Clara County;
- On-line flood hazard maps from Santa Clara Valley Water District; and
- Maps of Quaternary deposits and liquefaction susceptibility in the central San Francisco Bay region: U.S. Geological Survey, Open-File Report 2006-1037, in cooperation with the California Geological Survey.

2.4.2 Fault-Related Ground Rupture

Surface fault rupture tends to recur along existing fault traces. The highest potential for surface faulting is along existing fault traces that have had Holocene fault displacement. The California Geological Survey (formerly Division of Mines and Geology) has produced maps showing Alquist-Priolo Earthquake Fault Zones along faults with known Holocene activity that pose a potential surface faulting hazard. There are no Alquist-Priolo (A-P) zones mapped in the vicinity of the site. In addition, the Santa Clara County Fault Rupture Hazard Zones map does not identify any fault hazard zones crossing the project area. The closest A-P zoned fault to the site is a short section of the Southeast Extension of the Hayward fault (Evergreen fault) located about 2 miles northeast of the site. The Santa Clara County Fault Rupture Hazard Zones map shows the Silver Creek fault approximately 1,500 feet east of the site, however this mapped section of the fault is not within the A-P zoned boundary. The Silver Creek fault is considered to be an active fault by some (Hitchcock and Kelson, 1999; Fenton and Hitchcock, 2002). The San Andreas fault is located about 13.5 miles southwest of the site and the Calaveras fault is located about 5 miles northeast of the site. The potential for surface fault rupture at the site is considered low.

2.4.3 Landslide and Slope Failure

The project site is not within the mapped Santa Clara County Landslide Hazard Zone or the California Geological Survey Earthquake-Induced Landslide hazard zone. Due to the relatively flat topography at the site, landsliding is not a hazard.

2.4.4 Liquefaction

The project site is not within the mapped Santa Clara County Liquefaction Hazard Zone or the California Geological Survey Liquefaction hazard zone (CGS, 2001), and is located in an area shown with a "very low" liquefaction potential on the liquefaction susceptibility map (Witter, et al, 2006). No historic ground failures from either the Loma Prieta earthquake or the 1906 San Francisco earthquake have been recorded near the project site (Knudsen, et al, 2000).

Site specific exploratory data revealed low to medium plasticity clays of stiff to hard consistency, underlain by dense to very dense sands extending to 50 feet. These soils are not considered susceptible to liquefaction. Furthermore, groundwater was not encountered to the maximum 50 foot depth explored. Therefore, the potential for liquefaction of this site is considered to be low.

2.4.5 Flooding

The project site is located just to the north of Silver Creek. Flooding at the site is not a potential hazard. The site is located outside of the FEMA 100-year flood zone (i.e., the region that has approximately a 1% annual probability of flooding) as shown on the Santa Clara County flood hazard zone maps. However the active channel of Silver Creek, located about 400 feet south of the site is within the 100-year flood zone. The right-of-way of Yerba Buena Road, located immediately north of the site is also within the100-year flood zone. The site is also outside of the Dike Failure Hazard Zone as mapped by Santa Clara County.

2.4.6 Lateral Spreading

There are no slopes or creek channels near the site. Therefore, lateral spreading is not a hazard.

2.5 LIQUEFACTION POTENTIAL

Soil liquefaction is a phenomenon in which saturated, cohesionless soils lose their strength due to the build-up of excess porewater pressure during cyclic loading such as that induced by earthquakes. Soils most susceptible to liquefaction are clean, loose, fine-grained sands, and silts which are saturated.

The absence of groundwater, coupled with the stiff to hard clays and the dense granular soils encountered at the site , as reflected by the high blow counts, indicate that liquefaction potential at this site is low.

3.1 GENERAL

The principal geotechnical considerations at the site are the placement of engineered fill to achieve the desired finished grades, and the low to medium expansive nature of the near surface native soils which generally consists of stiff to hard clays, and have a medium potential for shrinkage and swelling when subjected to fluctuations in moisture content. These geotechnical considerations form the basis for the recommendations which follow.

4.1 FOUNDATION SUPPORT

4.1.1 Spread Footing Design

The existing native soils are suitable for shallow, spread and continous footings. In order to achieve the finish floor elevation, placement of engineered fill may be required over portions of the site. Provided the engineered fill is constructed in accordance with our recommendations, it is recommended that continous and spread footings be supported on native soils or on new non-expansive engineered fill. The bottom of footings should extend to a minimum embedment depth of 2 feet below the lowest adjacent finished grade. Design bearing pressures of 2,500 pounds per square foot (psf) for dead loads, 3,500 psf for dead plus live loads, and 4,500 psf for all loads including wind or seismic, are recommended for footings bearing on the recommended native soils or engineered fill.

It is recommended that the Geotechnical Engineer observe the site grading and test the compaction of the new fill, and observe the bottom of the footings before any steel reinforcement or concrete is placed.

4.1.2 Estimated Settlement

It is estimated that post-construction total and differential settlements of spread footings designed in accordance with our recommendations will not exceed about ¾ inch and ½ inch, respectively.

4.1.3 Foundation Resistance to Lateral Loads

Resistance to transient lateral loads from wind or earthquakes can be developed by friction between the bottom of the footings and the soil, and passive resistance on the front face of the footings. An ultimate coefficient of friction of 0.35 should be used between the bottom of the footings and underlying soil, not to exceed an adhesion of 800 psf, provided that the footings are cast neat against the engineered fill. Ultimate passive resistance of the soil may be estimated using an equivalent fluid weight of 350 pounds per cubic foot (pcf) acting against the footings. The upper 1-foot of embedment should be neglected for resistance. The recommended values presented above are ultimate values, and should be used with an appropriate factor of safety.

4.2 2001 CALIFORNIA BUILDING CODE DESIGN PARAMETERS

The site is located in Seismic Zone 4 and can be classified, from a seismic standpoint, as being a relatively stiff site with soil depth exceeding 200 feet. The site is classified as Soil Profile Type S_D (average shear wave velocity for the upper 100 feet is estimated to be between 600 and 1,200 feet per second) as noted in Table 16-J of the 2001 California Building Code. The Southeast Extension of the Hayward fault, which passes about 2 miles east northeast of the site, is considered a Type B seismic source and the controlling fault for this site.

Based on the Seismic Source Type and closest distance to the known seismic source described above, the following values are recommended for use in design of the proposed Fire Station 36:

Seismic Zone Factor, $Z =$ 0.4 (Table 16-I);
Near Source Factor, $N_a = 1.22$ (Table 16-S);
Near Source Factor, $N_v = 1.49$ (Table 16-T);
Seismic Coefficient, $C_a = 0.44\ N_a = 0.54$ (Table 16-Q); and
Seismic Coefficient, $C_v = 0.64\ N_v = 0.95$ (Table 16-R).

4.3 SLAB-ON-GRADE

We recommend the slab-on-grade floor of the new building be supported on a minimum section of 2 feet of engineered fill. Engineered fill constructed to support the new slab-on-grade floors should be compacted to a minimum relative compaction of 95 percent in accordance with ASTM Test Designation D1557 and meet the quality requirements for fill materials discussed in Section 4.5 and in the suggested guide specifications (Appendix B).

Moisture will come into contact with the floor slab due to moisture vapor migration and/or capillary water rise through the soil. If moisture in the floor slab is undesirable, some form of moisture barrier should be provided. It is recommended that a moisture barrier consisting of 4 inches of clean gravel or clean crushed stone be used as a capillary/moisture break. A moisture-proof membrane, such as 10-mil visqueen or equivalent, covered by 2 inches of moist sand should be placed above the rock. The sand should be moistened prior to placement of the concrete slab. The sand and gravel placed as part of the capillary break/moisture barrier system can be used as part of the recommended engineered fill section beneath the slab-on-grade floor.

4.4 PAVEMENTS

The near surface native and fill soils across the site consist primarily of lean clays with some gravels and are considered to exhibit low to moderate plasticity characteristics. The following recommended pavement sections are based on placing the pavement on the existing native soils with a design R-value of about 10.

Traffic Type	Recommended Pavement Section (inches)		
	Portland Cement Concrete	Asphalt Concrete	Class 2 Aggregate Base
Automobile Traffic and Parking Lot	-	3	7
Truck Access and Parking	-	4	10
Truck Access and Parking	8	-	6

All pavement sections should be constructed in accordance with Caltrans Standard Specifications, latest edition, except that the relative compaction should be based on ASTM Test Designation D 1557, using the dry density basis. In particular, the asphalt concrete pavements should conform to Caltrans Section 39, the concrete pavements should conform to Sections 40 and 90 and the Class 2 Aggregate Base should conform to Section 26 of Caltrans Standard Specifications. The top 6 inches of the pavement section subgrade should be compacted to at least 95 percent relative compaction. Additionally, all aggregate base should be compacted to at least 95 percent relative compaction. These pavement sections would be appropriate for a 20-year pavement design life.

The pavement subgrade underlying Class 2 Aggregate Base should be properly prepared and compacted to a minimum relative compaction of 95 percent in accordance with the recommendations outlined in Section 4.5.4, Subgrade Preparation. Subgrade moisture conditioning and compaction should be done just prior to placement of aggregate base. Deeper subgrade preparation than shown on the above table could be needed if localized soft or weak soil is encountered.

The aggregate base course should be compacted to a minimum relative compaction of 95 percent (ASTM Test Designation D1557). Aggregate base should conform to the requirements of Section 26 of the California Department of Transportation Standard Specifications for Class 2 Aggregate Base (1½ inch or ¾ inch maximum).

We recommend all pavement materials and construction conform to the applicable sections of the Caltrans Standard Specifications, as follows:

Pavement Material	Type of Material	Specification Section
Asphalt Concrete	Class B, ½-inch or ¾-inch maximum, dense graded	39
Aggregate Base	Class 2, 1-½ inch or ¾-inch maximum size	26
Asphalt Cement	AR-4000	92
Prime Coat	MC-70 or MC-250	93
Slurry Seal	As specified	37
Asphalt Emulsion	SS-1	37, 94

Additional recommendations for PCC pavement are as follows:

- Concrete should have a minimum modulus of rupture of at least 550 pounds per square inch (equivalent to a compressive strength of 3,700 psi) before the pavement is subjected to traffic.
- Provide expansion joints between buildings and pavements; the Contractor should provide a shop drawing indicating the proposed joint material.
- Provide weakened plane contraction joints at maximum 12-foot grid spacing by either saw cutting to a minimum depth of 3 inches or installing preformed material full depth; the purpose of these joints is to relieve tensile stresses, thereby minimizing the potential for volunteer cracking elsewhere in the pavement.
  - Saw cut width should be the minimum possible and less than ¼ inch.
  - Saw cut should occur within time period specified in Caltrans Specification Section 40-1.08B (1). Timing of the saw cutting is of the utmost importance, since it is necessary to saw the joint before volunteer cracking occurs. Typically, this is within 12 to 24 hours after concrete placement.
  - All joints should be sealed with joint filler in accordance with Caltrans Section 40-1.08B (1).
- Length of given panel should not exceed its width by more than 25 percent.
- Provide 6x6-W1.5xW1.5 welded wire mesh.
  - Place in middle of slab.
  - Do not place across joints.

A representative of URS should be retained during construction to review the soil conditions encountered and the construction procedures used.

4.5 EARTHWORK

All site preparation and earthwork should be done under the observation of a representative of our firm and in accordance with the recommendations presented below. Suggested guide specifications for "Earthwork" are presented in Appendix B.

4.5.1 Clearing and Stripping

Areas to be graded should be stripped and cleared of structures, foundations, trees, debris, and concrete flatwork. The Geotechnical Engineer should review the final depths of stripping and clearing during the site preparation. Materials resulting from clearing and stripping operations should be removed from the site. We recommend that stripped materials not be used as compacted fill or blended with other soils. All trees and their root systems should be removed in their entirety.

After the site has been properly prepared, the Geotechnical Engineer should review the subgrade conditions before any fill is placed.

4.5.2 Demolition

The development of the site may require the removal of existing underground utilities. In addition, any existing fills should be removed. This demolition work should be monitored by the Geotechnical Engineer.

Where underground utilities, trenches, etc., exist beneath the proposed building site and 10 feet beyond, abandonment should proceed in accordance with the following recommendations.

- All buried utilities and trenches located within an imaginary 1.5 horizontal to 1 vertical plane drawn downward from the lowest outside edge of the closest footing, and within a depth less than 5 feet below the bottom of the footing, should be removed.
- In proposed parking and driveway areas, all buried utilities and trenches located within 3 feet of the pavement subgrade (bottom of lowest pavement course) should be removed or filled with concrete.
- If not removed or filled with concrete, utilities left in place should be adequately plugged to inhibit entry of water.

All trench excavations should be backfilled in accordance with the recommendations presented for underground utilities (Section 4.6).

4.5.3 Excavations

Excavations should be performed to the lines and grades presented in the project plans and specifications. If unsuitable materials are encountered during excavations, these materials should be removed in its entirety and replaced with well compacted engineered fill. The Geotechnical Engineer should review the final excavation depths and lateral dimensions during construction.

4.5.4 Subgrade Preparation

After the excavation has been completed to the satisfaction of the Geotechnical Engineer, the exposed surface should be scarified to a minimum depth of 6 inches, moisture conditioned and recompacted. A minimum relative compaction of 95 percent should be attained in the subgrade.

4.5.5 Fill Materials

All general fill material should be a soil or soil-rock mixture that is free of organic matter and other deleterious substances. It should not contain rocks or lumps over 6 inches in the greatest dimension, and not more than 15 percent larger than 2-½ inches. The near surface native soils have generally low to medimum plasticity and are considered suitable for use as engineered fill.

We recommend that the fill consist of a low plasticity, non-expansive soil or soil-rock mixture having a plasticity index not greater than 15. A Geotechnical Engineer from our firm should approve any fill that is imported for use as engineered fill.

4.5.6 Fill Placement and Compaction

Fill material should be spread in uniform lifts not exceeding 8 inches in uncompacted thickness where heavy equipment is used, and not more than 4 inches where light, hand-operated compactors are used. Before compaction begins, the fill should be brought to a moisture content that will permit proper compaction by either aerating the material if it is too wet, or spraying the material with water if it is too dry. Each lift should be thoroughly mixed before compaction to provide a uniform distribution of water content. To prevent drying of the subgrade soils, placement of fill should start immediately after the surface preparation and should proceed in a continuous operation until the site is brought to grade.

All fill material beneath foundations and slab-on-grade floors should be compacted to a minimum relative compaction of 95 percent, and at moisture content between optimum and 2 percent above the optimum moisture content. Relative compaction is defined as the ratio of the insitu dry density to the maximum dry density obtained in the laboratory in accordance with ASTM D1557.

4.6 UNDERGROUND UTILITY TRENCHES

For purposes of this section of the report, bedding is defined as material placed in a trench up to 1 foot above a utility pipe and backfill is all material placed in the trench above the bedding.

Unless concrete bedding is required around utility pipes, free-draining sand should be used as bedding. Sand proposed for use in bedding should be tested in our laboratory to verify its suitability and to measure its compaction characteristics. Sand bedding should be compacted by mechanical means to achieve at least 95 percent relative compaction based on ASTM D1557.

Approved, on-site, inorganic soil, or imported material may be used as utility trench backfill. Proper compaction of trench backfill will be necessary under and adjacent to structural fill, building foundations, concrete slabs and vehicle pavements. In these areas, backfill should be conditioned with water (or allowed to dry) to produce a soil-water content ranging between optimum and 2 percent above the laboratory optimum moisture content. All backfill should be placed in horizontal layers not exceeding 6 inches in thickness (before compaction). Each layer should be compacted to 90 percent relative compaction based on ASTM D1557. The upper 8 inches of pavement subgrade should be compacted to 95 percent relative compaction based on ASTM D1557.

Where any trench crosses the perimeter foundation line, the trench should be completely plugged and sealed with compacted lean clay soil for a horizontal distance of at least 2 feet on either side of the foundation.

The attention of Contractors, particularly the Underground Contractor, should be directed to the requirements of California Code of Regulations, Title 8, Construction Code Section 1540 regarding Safety Orders for "Excavations, Trenches, Earthwork."

4.7 SURFACE DRAINAGE

Surface drainage gradients should be planned to prevent ponding and to promote drainage of surface water away from building foundations, slabs, edges of pavements and sidewalks, and towards suitable collection and discharge facilities.

Water seepage or the spread of extensive root systems into the soil subgrades of foundations, slabs, or pavements, could cause differential movements and consequent distress in these structural elements. This potential risk should be given due consideration in the design and construction of landscaping.

4.8 CONSTRUCTION DEWATERING

Groundwater at the site was not encountered within 50 feet of the surface. However, if rainfall should accumulate in areas of the site, temporary construction dewatering may be necessary. It is our opinion that sump pumps will be able to handle water encountered in the shallow excavations.

4.9 ADDITIONAL SERVICES

We recommend that URS review the project documents to verify that they incorporate the intent of our geotechnical recommendations. We also recommend that URS observe the earthwork to verify that it is completed in accordance with the proposed documents and our recommendations.

This study provides geotechnical design parameters for the proposed Fire Station 36. The recommendations contained in this report are based on the information obtained from two exploratory borings completed at the site, and upon our experience and engineering judgment. We have assumed that the soil and geologic conditions at the site do not deviate substantially from those encountered or extrapolated from the exploratory borings.

If any variations or undesirable soil conditions are encountered during construction, or if the proposed construction will differ from that proposed at the present time, we should be notified so that supplementary recommendations can be provided, if necessary. URS should review the foundation and grading plans, and the specifications, prior to construction. All earthwork, grading and foundation construction also should be done under the observation of the Geotechnical Engineer.

No environmental studies were performed by URS for this project.

The recommendations presented in this report were developed with the standard of care commonly used in this profession. No other warranties are included, either express or implied, as to the professional advice included in this report.

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